Weatherby Lake 5 Year Sewer Plan #1 Rev 2 July 2010

Introduction

The Sewer Plan is designed to provide an objective and sound long range approach to maintaining the sewer system in good condition. The format of this plan has three elements 1) an objective assessment of the condition of the system and 2) a management approach to select what will be done to the system and the associated costs and 3) the planned work by year. West Ridge utility information is still being compiled and is not included, except as specifically noted.

Technical Assessment

System Overview

The sewer system consists of the grinder pumps, pressurized collection lines, gravity lines, bioxide injection system and interface with the two Kansas City lift stations. The City installed the sewer system in 1974-75 which consisted of supplying 309 homes with grinder pumps, pressurized collection system and gravity drain system. In 1991 the odor control was changed from hydrogen peroxide to a bioxide treatment system. As homes have been built in the community the number of grinder pumps has increased to 621 along with associated piping. An engineering evaluation of the gravity piping system and associated manholes was conducted in 2008. The total cost of recommended repairs over the next three years was \$515,990. The engineering report focused on the gravity system as the technology is not available to examine the pressurized portion of the system. The experience with the pressurized system indicated that the system appears to be in good condition. Attachment 1 is an extracted summary of the report.

Pressurized System

The pressurized system originates at the grinder pumps and carries the sewage to the point where it flows by gravity into the Kansas City system. All of these pressurized lines are made of polyvinylchloride (PVC) and have an expected life of many decades. The pipe from the grinder pumps to the collection lines are all 1 ¼ inch PVC and the total estimated length is 74,400 linear feet including West Ridge. The collection lines vary in size from 1 ½ to 6 inches in diameter and total an estimated 53,486 linear feet including West Ridge. Very few leaks have occurred and most were caused by ground shifts or accidental breakage caused by digging up other utilities. These ground shift caused breaks are typical of any buried piping system and there is nothing to indicate that the City has an abnormal situation. The number of breaks between the grinder pumps and the collection lines are provided in Attachment 2. The number of pressurized and gravity collection line breaks is provided in Attachment 3. Attachment 9 provides the approximate lengths of various sizes of line and is included only for completeness of data for this plan.

There are three models of grinder pumps installed in the City. Model 200 was used from initial installation to 1997 has been an excellent unit, rugged and easily repaired. A large

majority of houses are serviced by these pumps. Model 2000 was installed from 1997 to 2001 and was not a good unit. It is prone to numerous failures because it is not water proof. As these pumps fail they are replaced and not repaired. Model Extreme was installed from 2006 to current and uses many of the design features of the original pumps. These pumps to date are performing well. The number of grinder calls is provided as Attachment 4. End of life failure rates of the pumps is a key planning parameter. The data in Attachment 4 was analyzed and a model developed (see Appendix) that is a close approximation to the data and can be used to predict future failure rates.

Gravity System

There is a total of 8,381 feet of gravity lines in the City per the engineering report. Of this total there are 4695 feet of vitrified clay pipe (VCP), 228 feet of ductile iron pipe (DIP) and 3276 feet of PVC pipe. The different types of pipe reflect the time of the installation. The gravity line segments are all connected by concrete manholes typical of what was installed at the time. The engineering inspection of 2008 indicated corrective action was needed primarily on the clay pipe segments. The clay pipe is durable but brittle and eventually cracks and breaks due to ground shifts. The line will eventually fill in with dirt and block the line. The condition of the lines is summarized from the engineering report and shown in Attachment 5.

There are 51 manholes on the gravity system (none on the pressurized system); West Ridge adds 14 more. The manholes are made of concrete and are very durable but over time they deteriorate (corrode) due to hydrogen sulfide gas which is a byproduct of sewage. The engineering inspection found 3 manholes that had been covered over by road paving some time in the past and were not inspected. Since the engineering study, the manholes have been uncovered and inspected. The inspection evaluated the deterioration level and assigned a priority for repair/replacement. It was judged that 41 were a priority number 3 and 5 were a priority number 4 (worst). The condition of the manholes is summarized in Attachment 6.

Odor Control System

The bioxide injection system consists of 5 injection systems. Each system contains a two speed pump, flow meter, and supply tank. This system is necessary because by the time the sewage reaches the lift stations it is generating considerable hydrogen sulfide and will create odor problems and potential health problems (hydrogen sulfide is toxic). The bioxide minimizes the generation of hydrogen sulfide. In 2009 it was determined that the injection system at Wayland Circle did not supply the Pleasant Ford sewer line and this line was not being treated. This is probably the reason why there were occasional odor problems at the Kansas City Westside Drive lift station. A contract was put in place (7-13-09) with Siemens, the bioxide supplier, to install a system on Pleasant Ford line (at the intersection with Venita) and to provide maintenance in addition to the bioxide chemical on all five systems for three years. The maintenance agreement included monthly testing for optimal use of bioxide.

Kansas City System

The Kansas City sewage network within Weatherby Lake consists of 2 lift stations which collect sewage from Weatherby Lake and from the communities in the water shed both north and south of state highway 152 including Zona Rosa. There are a number of homes on Westside Drive and Forest where their sewage is piped directly into the Kansas City sewer collection lines. The Kansas City lift station on Westside Drive (located at O cove) pumps the waste to the Eastside Drive lift station. It does not have any odor control device. The Eastside Drive lift station (located just south of U cove) pumps the waste into the watershed East of Weatherby Lake which eventually goes to the waste treatment plant. The Eastside Drive lift station contains a biofilter to minimize potential odor from the lift station. This biofilter is the responsibility of Weatherby Lake and is included in the above Siemens contract for chemicals, testing, and maintenance. Tests are conducted monthly to verify proper operation. This lift station also has a portable emergency generator to power the pumps in case of electrical outage. The Westside Drive lift station has two separate power supplies with an automatic transfer switch.

Management Approach

Goal

The goal of this plan is to provide a highly reliable sewer system with odor problems being a rare event. Another goal is to optimize the reliability and cost of the system.

Funding

The City for a long time has maintained a policy that the sewer system must be paid from fees collected for sewer services. This is considered to be a sound policy and the intent is to continue that policy. There are no outstanding bonds on the system. The only current source of funding is through the collection of fees for sewer services. At present this income provides approximately \$570,000 per year for Kansas City sewage treatment, replacement of grinder pumps, odor control equipment (currently under contract), collection line repairs and grinder pump repairs. It also covers the cost of the system upgrades described below. The revenue and expense history summary is provided as Attachment 7 and the forecast is provided at Attachment 8. It is important to realize that funds must be accumulated to address the upgrades, purchasing new grinder pumps and having a reserve for unexpected major system problems.

Based on the inspection performed in 2008, lines were identified that should be repaired or replaced along with the approximate time frame when this should be done. Similarly, badly corroded manholes were identified. The engineering cost estimate to perform these repairs was \$515,990. Since receiving the engineers report the City has explored the use of insitu lining of the clay pipe. The insitu process inserts an epoxy soaked fiber liner into the clay tile which, in essence forms a pipe within a pipe. This is well proven technology and has the strength and durability approaching that of PVC pipe. Furthermore, it is much

less expensive than replacing the existing pipe; replacing is pipe is approximately \$70 per linear foot and insitu lining cost approximately \$26 per linear foot.

Similarly, there are proven technologies to refurbish manholes. Special concrete mixes for repair and spray on epoxy coatings to extend the life of the manhole have been developed. These techniques have been proven to bring the manholes to a nearly new condition while adding years of life. This also is much less expensive than replacing a manhole. For example the recent replacement of 3 manholes (they were corroded beyond repair) cost approximately \$14,000. Recent bids to perform the repair and epoxy coating for 3 similar manholes will cost approximately \$5,000.

Based on the utilization of the above technologies and the priority system in the engineering report, the City preceded to insitu line the clay pipe. At a cost of just under \$66,000; 2538 linear feet of clay pipe were lined in November 2009. Approximately 2157 linear feet of clay pipe remain to be lined (46%). The City awarded a contract for repair and life extension of the manholes in July 2010. At a cost of approximately \$70,000, 31 manholes will be treated which will leave 20 manholes plus 14 in West Ridge that remain to be treated. This work was not completed at the time of this writing.

At this time it is estimated that the City can insitu line <u>all</u> the clay pipe and repair and extend the life of <u>all</u> manholes for approximately half the cost estimated in the engineering report. That report would have corrected all the manholes but only address 1243 feet of clay pipe or only 25% of the total clay pipe.

It should be noted that Kansas City has issued letters explaining that their sewage collection system and treatment plant are in serious need of a \$2+ Billion upgrade. This will be passed on to customers including Weatherby Lake.

Priority

The engineering survey and analysis of the gravity lines and manholes is being used to establish the priorities for the repair of the gravity lines and manholes. The following represents the priorities established by the City based on the engineering study.

- 1. Use insitu methods to repair the clay pipe, starting with those in the poorest condition
- 2. Use insitu methods to repair of the manholes starting with those that are in the poorest condition
- 3. Use insitu methods to line all remaining gravity clay pipe.
- 4. Repair manholes and treat for life extension as funds become available.

The engineering study was not definitive in how long the clay pipes or the manholes will last and they recommended repair as soon as practical.

It should be noted that the West Ridge developer installed appropriately sized PVC lines.

Cost Options

Based on the experience to date and utilizing the technologies described above the plan is to continue to use the bimonthly rate charges to maintain the sewage system in reliable working condition. Furthermore, it is planned that rates be adjusted as needed to have sufficient funds over the next 2-3 years to complete the restoration of the sewer system and grow reserves for future costs.

For information, the grinder pump repairs averaged approximately \$285 per pump in 2009 (total cost was approximately \$48,000). A new pump costs approximately \$1525. The repair program is an essential part of the system upkeep.

The Plan

Repair/Replacement

Based on the technical assessment, the management approach, and available funds; the first priority of the plan is to insitu line the remainder of tile pipe in the near future 2011/2012. The collapse of a clay pipe is the biggest threat to the sewer system in terms of cost. To replace a line is estimated to cost nearly three times as much as the cost of insitu lining. Furthermore, with the continuing aging of the pipe, the risk of a collapsed line and the potential to seep sewage into the lake increases and this risk needs to be reduced.

The second priority is Manhole repair and the plan is to continue in 2012 and 2013 to complete the upgrade and extend the life of the manholes. The risk of not doing this is to incur costs for replacement which are nearly three times that of repair. There is also some risk of sewage seepage into the lake with deteriorated manholes.

The third priority is to resume purchasing new grinder pumps. Although the City recently acquired a significant number of used pumps in good condition, eventually the pumps will wear out or parts may become difficult to obtain. New pumps have been procured in the last several years but a deliberate replacement program should be put in place. The Appendix to this document provides a cost analysis which shows that procurement of approximately 25 pumps per year (\$38,000) would produce the minimum optimum cost of grinder pump maintenance. This program should be resumed starting in 2014. By that time, the predicted level of maintenance cost should be verified (or adjusted) and the cash reserves restored to allow the purchase of new pumps.

The fourth priority is a potential problem with the ductile iron pipe (DIP) as this material can build up corrosion nodules (crustation) which could block the line. Crustation can also occur at service and manhole connection points. There are 228 feet of DIP in five line segments (see comments column of Attachment 5). Crustation is occurring but it is

not yet at a high priority condition. These lines will be examined again in 2013 to determine if any ductile iron section needs to be replaced.

Inspections

Although the PVC lines should last many decades, there are some gravity PVC lines that have developed sags and are egg shaped at specific locations due most probably to ground movement. At some point these will have to be replaced but there is no way to predict when they might fail. The planned course of action is to inspect these lines in 2013. Inspection every five years is recommended.

Another routine preventive maintenance action that is being put into place is the flushing of the pressurized lines. In 2010 there was a major problem with the pressurized line between Eastside Drive and Thompson Park. Grit and scale had accumulated in a low section of line until blockage occurred. It was expensive to locate the line to determine the problem. Since that has not happened in the memory of city personnel, it was concluded that the other lines need to be flush and this repeated at a regular intervals.

Attachment 1

Extracted Summary of Engineering Report

| Description | Quantity | Units | Unit Price | TOTAL |
|-------------------------------------|----------|--------|---------------|---------|
| | | | | |
| 8" Sewer Pipe Lining – Insituform | 864 | Lin ft | \$35.00 | 30,240 |
| 8" Sewer Pipe Replacement | 379 | Lin ft | 70.00 | 26,530 |
| 8" Sewer Pipe Spot Replacement | 60 | EA | 3000.00 | 180,000 |
| 6" Sewer Pipe Spot Replacement | 1 | EA | 3000.00 | 3,000 |
| Root Cleaning Rehabilitation | 5 | EA | 200.00 | 1,000 |
| Spot Repair Service Line Connection | 4 | EA | 3000.00 | 12,000 |
| Power Wash and Seal Manhole | 37 | Vert | 120.00 | 4,440 |
| MC-2C | | ft | | |
| Power Wash and Seal Manhole | 36 | Vert | 145.00 | 5,220 |
| High Performance | | ft | | |
| Power Wash and Seal Manhole | 63 | Vert | 150.00 | 9,450 |
| Epoxy | | ft | | · |
| Chimney Seal Manhole | 20 | EA | 350.00 | 7,000 |
| Grout Manhole in/put Pipes | 15 | EA | 500.00 | 7,500 |
| MH New Frame and Cover | 3 | EA | 0 | |
| MH New Cover | 2 | EA | 0 | |
| MH Clean Frame and Cover | 3 | EA | 0 | |
| MH Adjust Frame and Cover | 10 | EA | 0 | |
| MH Reset Frame and Cover | 16 | EA | 0 | |
| MH Fill Around Frame and Cover | 8 | EA | 0 | |
| MH Replace Adjustment Rings | 11 | EA | 0 | |
| MH Reset Adjustment Rings | 5 | EA | 0 | |
| MH Replace Cone Section | 1 | EA | 0 | |
| MH Power Wash Bench | 9 | EA | 0 | |
| TOTAL Construction Cost | | | | 286,380 |
| Manhole work | | | | 33,610 |
| Sewer Repair Replacement | | | | 196,000 |
| Grand TOTAL Cost | | | | 515,990 |

Summary of Grinder to Collection Line Breaks

(All are 1 ¼ inch lines)

| Number of Breaks | Year * |
|------------------|-------------------|
| | |
| 13 | 2004 |
| 0 | 2005 |
| 13 | 2006 |
| 17 | 2007 |
| 3 | 2008 |
| 5 | 2009 |
| 2 | Through June 2010 |

^{*} Data prior to 2004 was not available.

Of the above total number for the listed years, roughly 10 were check valve failures. The original 309 installations were schedule 20 PVC with no check valves and shut off valve locations have since been lost

All subsequent installation use schedule 40 PVC and included check valves.

Attachment 3
Summary of Pressurized and Gravity Collection Line Breaks

| Location | Size of line | Number of Breaks | Year of Break * | Comment |
|-----------------------|--------------|------------------------|--------------------|---|
| | | Dicars | | |
| 77th Terr | 6" | 4 | 1993/4 | Pressurized Line |
| 74 th St | 3" | 1 | 1995 | Pressurized Line |
| Scenic | 6" | 1 | 1997 | Pressurized Line |
| 75 th Terr | 6" | 1 | 2002/3 | Pressurized Line |
| Westside Dr | 6" | 1 | 2005 | Gravity Line replacement at hairpin curve |
| Westside Dr | 6" | 1 | 2007 | Gravity Line Replacement from above new line to KC line |
| | | | | |

^{*} These are approximate time frames

Summary of Grinder Calls

| Number of Calls | Year | Houses | Comments (also see notes below) |
|-----------------|-----------|--------|-------------------------------------|
| | | | |
| 128 | 1997 | | Between 20 and 30 were frozen pipes |
| 99 | 2002 | | |
| 133 | 2003 | | |
| 171 | 2004 | | |
| 136 | 2005 | | |
| 170 | 2006 | | |
| 175 | 2007 | | |
| 192 | 2008 | | |
| 188 | 2009 | | |
| 142 | June 2010 | | |

The initial installation was 309 houses Approximately 100 homes were added in the 70"s and 80's. Another 100 homes were added between 1990 through 1995. By 2005 there were approximately 600 homes on grinder pumps.

Currently (June 2010) there are 621 grinder pumps installed.

Summary of Gravity Line Condition extracted from engineering report.

All line sizes are 8 inch unless otherwise indicated and all lengths are in feet. Comments in parenthesis are subsequent actions to correct problems.

| Location | Segment | Material | Priority | Length | Comments | Repair Actions |
|-----------------------|---------|----------|----------|--------|-------------------------|------------------|
| Eastside Dr | A1- | PVC | 1 | 49 | | |
| including | KCMO | | | | | |
| 80 th Terr | | | | | | |
| South of lift | | | | | | |
| station | | | | | | |
| | A1-A2 | VCP | 3 | 207 | Cracked | |
| | A2-A5 | VCP | 3 | 87 | Broken | |
| | A3-A2 | VCP | 5 | 244 | Broken | Repair by insitu |
| | | | | | | lining the pipe |
| | A3-A4 | VCP | 4 | 157 | Broken | |
| | A3-A7 | VCP | 2 | 126 | Cracked and sag in line | |
| | A6-A5 | VCP | 2 | 265 | Cracked, 10ft is 7" PVC | |
| Eastside Dr | B1- | VCP | 2 | 29 | Crustated | |
| North of lift | KCMO | | | | | |
| station | | | | | | |
| | B2-B1 | VCP | 3 | 89 | Cracked | |
| | B2-B3 | VCP | 3 | 91 | Cracked and broken | |
| | B3-B4 | VCP | 2 | 60 | Cracked | |
| | B5-B4 | VCP | 4 | 296 | Cracked and broken | |
| | B6-B5 | VCP | 2 | 258 | Cracked | |
| | B7-B6 | VCP | 3 | 220 | Cracked and broken | |
| | B7-B7A | VCP | 3 | 163 | Cracked and broken | |
| Forest Drive | C1- | DIP | 2 | 49 | Crustated | |
| | KCMO | | | | | |
| | C2-C1 | VCP | 2 | 184 | Cracked, sag in line | Repair by insitu |
| | | | | | | lining the pipe |
| | C2-C9 | VCP | 2 | 172 | | Repair by insitu |
| | | | | | | lining the pipe |
| | C3-C2 | VCP | 3 | 327 | Cracked and broken | Repair by insitu |
| | | | | | | lining the pipe |
| | C4-C3 | VCP | 2 | 159 | Sage in line | Repair by insitu |
| | | | | | | lining the pipe |

| | C5-C4 | VCP | 2 | 160 | Cracked, sag in line | Repair by insitu |
|-------------|---------|-----|---|-----|------------------------------|------------------|
| | | | | | | lining the pipe |
| | C6-C5 | VCP | 3 | 117 | Cracked and broken | Repair by insitu |
| | | | | | | lining the pipe |
| | C7-C6 | VCP | 2 | 196 | | Repair by insitu |
| | | | | | | lining the pipe |
| | C7-C8 | VCP | 2 | 110 | Sage in line | Repair by insitu |
| | | | | | | lining the pipe |
| Pleasant | D1- | VCP | 2 | 232 | Cracked, 3 ft segment of PVC | |
| Ford | KCMO | | | | | |
| | D1-D2 | VCP | 2 | 84 | Cracked and broken | Repair by insitu |
| | | | | | | lining the pipe |
| | D3-D2 | VCP | 4 | 125 | Cracked and broken | Repair by insitu |
| | | | | | | lining the pipe |
| | D4-D3 | VCP | 3 | 338 | Cracked and broken | Repair by insitu |
| | | | | | | lining the pipe |
| Westside at | E1- | PVC | 1 | | Replaced 2007 Not inspected | |
| hairpin | KCMO | | | | | |
| curve | | | | | | |
| | E2-E1 | PVC | 1 | | Replaced 2007 Not inspected | |
| | E3-E2 | VCP | 5 | 272 | Broken | Repair by insitu |
| | | | | | | lining the pipe |
| 2315 | F1- | VCP | 3 | 137 | Cracked, broken, sags, 3ft | |
| Westside Dr | KCMO | | | | segment of PVC | |
| Weatherby | D1-G1 | PVC | 2 | 63 | Sag in line | |
| Dr and | | | | | | |
| Westside | | | | | | |
| | G2-G1 | PVC | 2 | 78 | Crustation, sag, 15ft of DIP | |
| | G2-G3 | PVC | 2 | 189 | 54ft of DIP | |
| | G3-G4 | PVC | 2 | 314 | | |
| | G3-G9 | PVC | 2 | 176 | | |
| | G6-G3 | PVC | 1 | 63 | | |
| | G7-B6 | PVC | 2 | 208 | 55ft of DIP | |
| | G7-G8 | PVC | 2 | 107 | | |
| | G4-G5 | PVC | 2 | 288 | | |
| Roberts Rd | H1- | PVC | 3 | 243 | 55ft of DIP | |
| South | KCMO | | | | | |
| | H1-H2 | PVC | 1 | 142 | | |
| | H2-H7 | PVC | 2 | 124 | | |
| | H3-H2 | PVC | 2 | 103 | | |
| | H3-H4 | PVC | 2 | 208 | | |
| | 113-114 | | | | | |
| | H5-H6 | PVC | 2 | 217 | Sag in line | |

| Roberts Rd | I1- | PVC | 1 | 119 | | |
|--------------|-------|-----|---|------|------------------------------|--|
| North side | KCMO | | | | | |
| | I1-I2 | PVC | 2 | 274 | | |
| 8313 | J1- | PVC | 2 | 315 | Sag in line, 6" pipe | |
| Hillside | KCMO | | | | | |
| West Ridge | K1-14 | PVC | 1 | 2256 | Individual line segments | |
| gravity pipe | | | | | between manholes not yet | |
| | | | | | measured and was not part of | |
| | | | | | the engineering study | |

DIP is ductile iron pipe PVC is polyvinylchloride material VCP is vitrified clay pipe

Priority 1 – no defects

Priority 2 – Rehabilitation more that 5 years

Priority 3 - Rehabilitation in 3-5 years

Priority 4 - Rehabilitation in 1-2 years

Priority 5 - Rehabilitation is urgent

Summary of Manhole Condition extracted from engineering report

All line sizes are 8 inch unless otherwise indicated and all lengths are in feet. Comments in parenthesis are subsequent actions to correct problems or extend the life.

| Location | Manhole | Match to grade | Reseal | Priority | Comments | Repair contract awarded work to start in August 2010 |
|---|---------|----------------------|--------|----------|-----------------------|---|
| Eastside Dr including 80 th Terr South of lift station | A1 | X | X | 3 | | Repair contract awarded, work to start in August 2010 |
| | A2 | X | X | 3 | | Repair contract awarded, work to start in August 2010 |
| | A3 | | X | 3 | | Repair contract awarded work to start in August 2010 |
| | A4 | X | X | 3 | | Repair contract awarded work to start in August 2010 |
| | A5 | | | | Buried, not inspected | Dug out and inspected. Repair contract awarded work to start in August 2010 |
| | A6 | | X | 3 | | Repair contract awarded work to start in August 2010 |
| | A7 | X | | 2 | | Repair contract awarded work to start in August 2010 |
| Eastside Dr North of lift station | B1 | X | | 2 | | Repair contract awarded work to start in August 2010 |
| | B2 | X | | 2 | | Repair contract awarded work to start in August 2010 |
| | В3 | X | | 3 | | Repair contract awarded work to start in August 2010 |

| | B4 | X | | 1 | | Repair contract |
|--------------|-----|----------|---|---|-----------------------|---------------------------------------|
| | D¬ | 71 | | 1 | | awarded work to start |
| | | | | | | in August 2010 |
| | B5 | X | | 2 | | Repair contract |
| | | 71 | | 2 | | awarded work to start |
| | | | | | | in August 2010 |
| | B6 | X | X | 3 | | Repair contract |
| | Do | A | 1 | | | awarded work to start |
| | | | | | | in August 2010 |
| | B7A | | | | Buried, not inspected | Dug our and |
| | DIA | | | | Buried, not inspected | inspected. Repair |
| | | | | | | contract awarded |
| | | | | | | work to start in |
| | | | | | | August 2010 |
| | B7 | X | X | 4 | | Repair contract |
| | D/ | Λ | Λ | 4 | | awarded work to start |
| | | | | | | in August 2010 |
| Forest Drive | C1 | X | | 3 | | Repair contract |
| Tolest Dilve | CI | Λ | | 3 | | awarded work to start |
| | | | | | | |
| | C2 | X | X | 3 | | in August 2010 |
| | C2 | Λ | Λ | 3 | | Repair contract awarded work to start |
| | | | | | | |
| | C3 | X | | 4 | | in August 2010 |
| | CS | A | | 4 | | Repair contract awarded work to start |
| | | | | | | |
| | CA | X | | 2 | | in August 2010 |
| | C4 | Λ | | 2 | | Repair contract awarded work to start |
| | | | | | | |
| | CF | | | | Devied wet in sected | in August 2010 |
| | C5 | | | | Buried, not inspected | Dug out and |
| | | | | | | inspected. Repair |
| | | | | | | contract awarded |
| | | | | | | work to start in |
| | C6 | X | | 3 | | August 2010 |
| | C6 | A | | 3 | | Repair contract |
| | | | | | | awarded work to start |
| | C7 | V | | 2 | | in August 2010 |
| | C7 | X | | 3 | | Repair contract |
| | | | | | | awarded work to start |
| | CO | 37 | | 2 | | in August 2010 |
| | C8 | X | | 3 | | Repair contract |
| | | | | | | awarded work to start |
| | | | | | | in August 2010 |

| | C9 | X | | 3 | | Repair contract |
|-------------|------------|----------------|----|-----|-------------------------------|---------------------------------------|
| | C9 | Λ | | 3 | | awarded work to start |
| | | | | | | |
| Dlaggant | D1 | | X | 3 | | in August 2010 |
| Pleasant | וע | | A | 3 | | Repair contract awarded work to start |
| Ford | | | | | | |
| | DO | | 77 | | | in August 2010 |
| | D2 | | X | 3 | | Repair contract |
| | | | | | | awarded work to start |
| | | | | | | in August 2010 |
| | D3 | X | X | 3 | | Repair contract |
| | | | | | | awarded work to start |
| | | | | | | in August 2010 |
| | D4 | | X | 4 | | Repair contract |
| | | | | | | awarded work to start |
| | | | | | | in August 2010 |
| Westside at | E1 | | X | 3 | | Repair contract |
| hairpin | | | | | | awarded work to start |
| curve | | | | | | in August 2010 |
| | E2 | | X | 3 | | Repair contract |
| | | | | | | awarded work to start |
| | | | | | | in August 2010 |
| | E3 | | X | 4 | | Repair contract |
| | | | | | | awarded work to start |
| | | | | | | in August 2010 |
| 2315 | F1 | | X | 3 | | |
| Westside Dr | | | | | | |
| Weatherby | G1 | | X | 3 | | |
| Dr and | | | | | | |
| Westside | | | | | | |
| | G2 | | X | 2 | | |
| | G3 | | X | 2 | | |
| | G4 | X | X | 3 | | |
| | G5 | | X | 2 | | |
| | G6 | X | X | 3 | | |
| | G 7 | X | X | 3 | | |
| | G8 | X | X | 3 | | |
| | G9 | - - | X | 2 | | |
| Roberts Rd | H1 | | X | 3 | | |
| South | | | | | | |
| 200011 | H2 | X | X | 3 | | |
| | H3 | X | | 3 | | |
| | H4 | X | | 3 | | |
| | H5 | X | | 4 | Reinspected and repair is not | |
| | 113 | A | | 7 | urgent | |
| | Н6 | X | | 3 | argoni argoni | |
| | 110 | 11 | | 1 3 | | |

| | H7 | X | X | 3 | | |
|------------|-------|---|---|---|--------------------------------|---------------|
| Roberts Rd | I1 | X | | 2 | | |
| North side | | | | | | |
| | I2 | X | X | 3 | | |
| 8313 | J1 | | | | Not inspected | Scheduled for |
| Hillside | | | | | | inspection |
| West Ridge | K1-14 | | | 1 | Individual manholes not yet in | |
| | | | | | the database and not part of | |
| | | | | | engineering study | |

Priority 1 – no defects
Priority 2 - Rehabilitation in 3-5 years
Priority 3 - Rehabilitation in 1-2 years
Priority 4 - Rehabilitation is urgent

Attachment 7 Sewer Department Revenue and Expenses History (Dollar)

| | Budget | | |
|---------|--|--|---|
| 2007 | 2008 | 2009 | 2010 |
| _ | | | |
| | | | |
| 386,000 | 449,000 | 504,000 | 540,000 |
| | | | |
| 29,000 | 22,000 | 22,000 | 20,000 |
| | | | |
| 28,000 | 0 | 22,000 | 8,000 |
| 3,000 | 6,000 | 8,000 | 1,000 |
| 449,000 | 477,000 | 556,000 | 569,000 |
| | | | |
| 150,000 | 120,000 | 107.000 | 210.000 |
| * | · | | 218,000 |
| , | , | , , , , , , , , , , , , , , , , , , , | 93,000 |
| 15,000 | 18,000 | 16,000 | 17,000 |
| 0 | 11,000 | 4,000 | 8,000 |
| 37,000 | 9,000 | 76,000 | 15,000 |
| 67,000 | 63,000 | 48,000 | 50,000 |
| 40,000 | 41,000 | 29,000 | 38,000 |
| 19,000 | 45,000 | 39,000 | 40,000 |
| 33,000 | 43,000 | 26,000 | 25,000 |
| 445,000 | 454,000 | 503,000 | 504,000 |
| | | | |
| 4,000 | 23,000 | 53,000 | 65,000 |
| | 386,000 29,000 28,000 3,000 449,000 158,000 76,000 15,000 0 37,000 67,000 40,000 19,000 33,000 445,000 | 386,000 449,000 29,000 22,000 28,000 0 3,000 6,000 449,000 477,000 158,000 128,000 76,000 96,000 15,000 18,000 0 11,000 37,000 9,000 67,000 63,000 40,000 41,000 19,000 45,000 33,000 43,000 445,000 454,000 | 386,000 449,000 504,000 29,000 22,000 22,000 28,000 0 22,000 3,000 6,000 8,000 449,000 477,000 556,000 158,000 128,000 185,000 76,000 96,000 80,000 15,000 18,000 16,000 0 11,000 4,000 37,000 9,000 76,000 67,000 63,000 48,000 40,000 41,000 29,000 19,000 45,000 39,000 33,000 43,000 26,000 445,000 503,000 |

Attachment 8
Sewer Department Revenue and Expenses Forecast

| | Budget 2010 | Forecast | | | |
|-----------------|----------------|----------|---------|---------|---------|
| Year | | 2011 | 2012 | 2013 | 2014 |
| | | | | | |
| Revenue | | | | | |
| Sewer Services | 540,000 | 540,000 | 614,000 | 675,000 | 769,000 |
| Sold | | | | | |
| Grinder Service | 20,000 | 43,000 | 65,000 | 70,000 | 75,000 |
| Fee | | | | | |
| New Hookups | 8,000 | 7,000 | 5,000 | 5,000 | 5,000 |
| Other Revenue | 1,000 | 5,000 | 3,000 | 3,000 | 3,000 |
| TOTAL | 569,000 | 595,000 | 687,000 | 755,000 | 845,000 |
| | | | | | |
| Expenses | | | | | |
| KC Treatment | 218,000 | 250,000 | 305,000 | 365,000 | 439,000 |
| Payroll | 93,000 | 105,000 | 113,000 | 116,000 | 120,000 |
| Benefits | 17,000 | 19,000 | 24,000 | 25,000 | 27,000 |
| Engineering | 8,000 | 3,000 | 0 | 5,000 | 5,000 |
| Leak Repair | 15,000 | 25,000 | 25,000 | 25,000 | 30,000 |
| Grinder Repair | 50,000 | 40,000 | 35,000 | 35,000 | 35,000 |
| Odor Chemicals | 38,000 | 50,000 | 52,000 | 55,000 | 58,000 |
| New Grinders | 40,000 | 30,000 | 35,000 | 35,000 | 40,000 |
| Other Expense | 25,000 | 26,000 | 28,000 | 23,000 | 21,000 |
| TOTAL | 504,000 | 548,000 | 617,000 | 685,000 | 715,000 |
| | | | | | |
| Surplus | | | | | |
| TOTAL | 65,000 | 47,000 | 70,000 | 70,000 | 70,000 |
| | | | | | |

Pressurized line sizes and lengths

Note where streets and lines are the same size, line sections goes different directions.

| Street | Pipe Size (inches) | Approximate Length (ft) | |
|------------------------------|--------------------|-------------------------|--|
| Eastside of the Lake | | | |
| | | | |
| 72 Terrace | 3 | 2000 | |
| 72 Street including McDonald | 3 | 1150 | |
| 73 Street | 2 | 650 | |
| 73 Terrace | 2.5 | 1500 | |
| 73 Terrace | 4 | 500 | |
| 74 Street | 4 | 1870 | |
| 75 Street | 6 | 1240 | |
| 75 Terrace | 6 | 1350 | |
| 76 Terrace | 3 | 775 | |
| 77 Street | 2.5 | 520 | |
| 77 Terrace | 2.5 | 900 | |
| 77 Terrace | 6 | 600 | |
| 78 Street | 3 | 1670 | |
| 79 Street | 2 | 650 | |
| 80 Terrace | 6 | 700 | |
| 81 Street | 1.5 | 350 | |
| Barr Lane | 6 | 670 | |
| Davis Court | 2.5 | 630 | |
| Eastside Drive | 2.5 | 300 | |
| Eastside Drive | 2.5 | 600 | |
| Eastside Drive | 3 | 800 | |
| Eastside Drive | 4 | 1000 | |
| Eastside Drive | 4 | 1900 | |
| Eastside Drive | 6 | 650 | |
| Eastside Drive | 6 | 1700 | |
| Quincy Court | 2 | 200 | |
| Rocky Point | 2.5 | 800 | |
| Scenic Drive | 6 | 1600 | |
| Whipple Lane | 4 | 515 | |
| | | | |
| Total | | 27,790 | |

| Westside of the Lake | | | | |
|--|-----|---------|--|--|
| THE SUBJECT OF THE SUBJECT | | | | |
| 75 Street | 2 | 300 | | |
| 75 Terrace | 3 | 400 | | |
| 75 Terrace East | 2 | 150 | | |
| 75 Terrace West | 2 | 300 | | |
| 76 Street | 2 | 700 | | |
| 76 Street | 4 | 400 | | |
| 82 Terrace | 2.5 | 350 | | |
| 82 Terrace | 3 | 500 | | |
| Hillside | 4 | 1610 | | |
| Kerns | 2 | 300 | | |
| Kerns | 2.5 | 400 | | |
| Kerns | 2.5 | 250 | | |
| Kerns | 3 | 400 | | |
| Lynns Lane | 2.5 | 750 | | |
| Miami North | 2.5 | 500 | | |
| Miami North | 3 | 600 | | |
| Miami South | 3 | 600 | | |
| Pleasant Ford | 4 | 1800 | | |
| Potomac | 2.5 | 700 | | |
| Potomac | 3 | 1200 | | |
| Roberts Road | 3 | 1600 | | |
| Roberts West Ridge | 1.5 | 900 | | |
| Roberts West Ridge | 2 | 850 | | |
| Roberts West Ridge | 2.5 | 200 | | |
| Roberts West Ridge | 3 | 350 | | |
| Venita Drive | 2 | 200 | | |
| Venita Drive | 2.5 | 1400 | | |
| Venita Drive | 3 | 600 | | |
| Wayland Drive | 4 | 750 | | |
| Westside Drive | 2 | 300 | | |
| Westside Drive | 4 | 4000 | | |
| West Ridge | 1.5 | 921 | | |
| West Ridge | 2 | 864 | | |
| West Ridge | 2.5 | 198 | | |
| West Ridge | 3 | 353 | | |
| Total | | 25,696 | | |
| | | F2 40 (| | |
| Total Pressurized Collection Line 53,486 | | | | |

Appendix: Cost Estimating Model

The objective was to develop a cost estimating model that could be used to determine the optimum minimum cost for repairing vs purchasing new grinder pumps. This model is important in that it suggests that the cost of repairs could increase significantly over the next few years unless the mix of old and new pumps is significantly changed. This model and its development is provided so that if there is a significant increase in the repair costs there is a reasoned approach to bring the costs back to an optimum level.

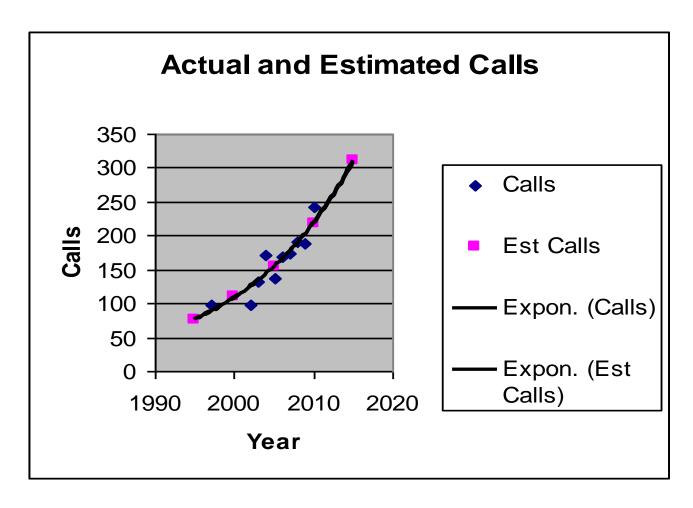
There are three assumptions for the model. The first is that the data in Attachment 4 (with an extrapolated estimated number of calls for 2010 using a simple ratio from data through July to the end of the year) will be sufficient to validate the model. The second is that the failure rate of the pumps is typical of mechanical equipment failure rates which are an exponential function of age or usage. The third is that the pumps can be group to minimize the number of calculations without significantly affecting the results. What this means is that it was assumed there were 300 pumps installed in 1975, another 100 installed in 1985, another 100 installed in 1995 and another 100 installed in 2005 for a total of 600 pumps. The actual numbers are a few % different but the difference is minimized by being consistent in the application of the below parameter test.

The method to develop the model was separated into several steps. The first step was to develop a mathematical equation using trial and error that would closely represent the data from Appendix 4. The next step was to take each parameter of the equation and determine what would happen to the estimated calls if the component varied on either side of the selected numbers. The equation developed was:

$$F=cy2^x$$

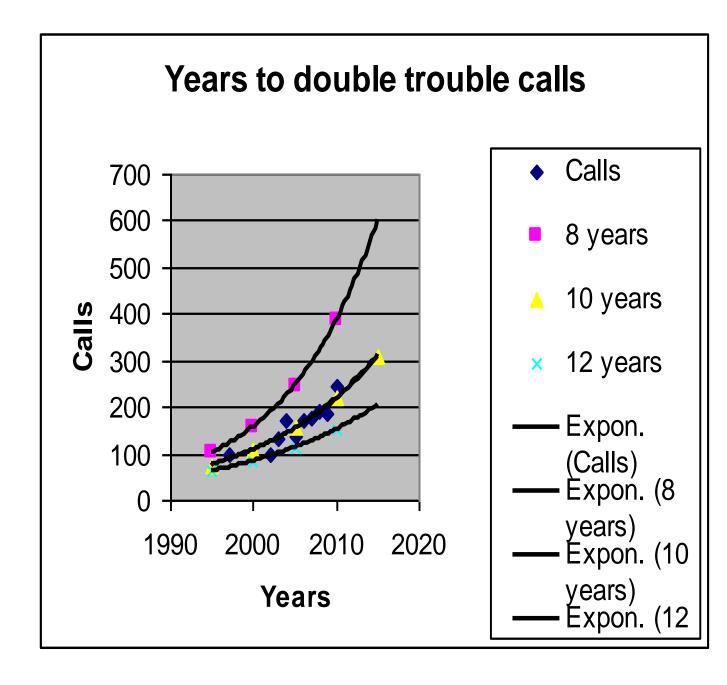
Where "F" is the number of pump trouble calls; "c" is a coefficient selected; "y" is the number of pumps in each group divided by 100; "2" means there is a doubling of trouble calls for every "x" period of time; and x is the age in years of the group of pumps divided by the years to double the number of calls.

Each parameter was arbitrarily chosen (except the 2) and the final parameters were c=5, y=100/100 for the model verification and y=165/100 for the cost optimization and x= (pump group age)/10. The following graph illustrates a very good match to the data.

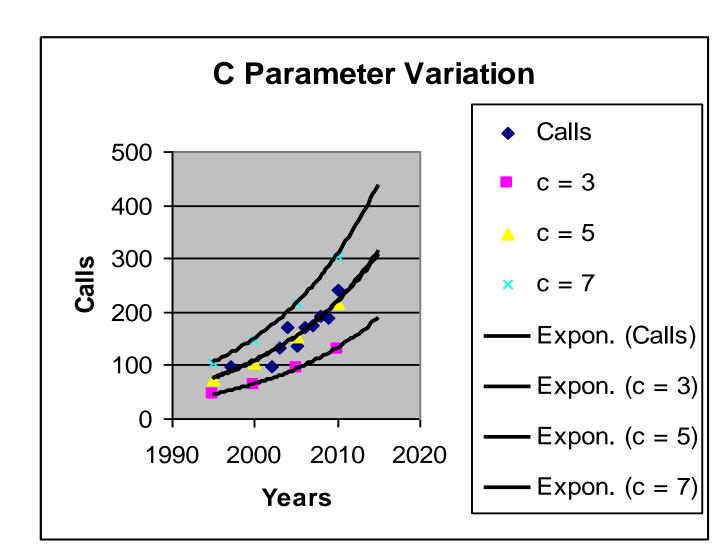


As can be seen the two lines correspond almost exactly

Next the "x" parameter was varied from 10 years to double the number of calls to 8 years and 12 years. As can be seen from the below chart that the two year difference from 10 years results in much less satisfactory match with the data of Attachment 4



Next the "c" parameter was varied from 5 to 3 and 7. As can be seen from the below chart that the difference from the coefficient of 5 results in less satisfactory match with the data of Attachment 4.



The "y" parameter was set to one by using pump groups in increments of 100 and therefore does not affect the validation process. This concludes the model verification and the model is judged to be acceptable to determine cost information.

The cost information was developed as a function of repair costs and procurement costs. Repair costs averaged \$285 per call in 2009 and the purchase of a new pump was \$1525 current price. The model was used to assess the number of calls from a 20 year life to a 40 year life in 5 year increments. The grouping of the pumps was set at 4 intervals and the total number of pumps chosen was 665. Since the objective is to have a consistent cost every year for planning purposes the grouping of the pumps for the 4 intervals was set to be the same at 165. The total number of pumps assumes an approximate full build out of the community. The below chart indicates the cost estimate for various pump ages of economic life.

It may be a number of years before the data reflects an even life for each group. Aside from the fact that we do not keep installation data, the usage of each pump varies considerably, the date of installation does not provide a more accurate assumption than that which was used.

Grinder Pump Repair and Replace Cost Optimization.

| Economic | Trouble | Repair Cost | New | Replacement | Total Cost |
|--------------|------------|-------------|------------|-------------|------------|
| life (years) | Calls (per | (\$) | Pumps | Cost (\$) | (\$) |
| | year) | | (per year) | | |
| 20 | 77 | 24,100 | 33 | 50,300 | 74,400 |
| 25 | 98 | 38,800 | 27 | 40,300 | 71,100 |
| 30 | 121 | 37,900 | 22 | 33,600 | 71,500 |
| 35 | 159 | 49,900 | 19 | 28,500 | 78,400 |
| 40 | 211 | 66,100 | 17 | 25,200 | 91,300 |
| | | | | | |

From the chart the optimum cost is for the life of the pumps is 25-30 years and the procurement of new pumps should be at the rate of approximately 25 per year.